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and make meteorological observations.——Lieut. Schwatka is making a thorough exploration of the courses of the Chilkat, Lewis and Yukon.——In the *Izvestia* M. Karzin, an official of the Verkhoyansk district, struck with the terrible fate of De Long, publishes a list of all settlements and places where human beings can be met with at different seasons on the coast of Northeast Siberia.——The Indian population of British North America is, by a recently issued report, estimated at about 110,000. It is supposed that the total native population of America, north of the United States, is about 146,000, of which some 25,000 are Innuit and Aleuts.——The planting of *Pinus pinaster* in the Landes of Southwestern France has effected a great improvement of this district. The Grande Lande, formerly a marsh in winter and a sandy desert in summer, consisting of loose soil on an impermeable hardpan (*alios*) of sandstone cemented by organic and ferruginous material, is now a forest, the resin from which is a valuable product. The dunes which stretch along the coast from the Adour to the Gironde, forming a belt four to eight kilometers wide, and stated by M. E. Blanc to come from a submerged continuation of the Landes, are now entirely wooded over. Some of these dunes reach a height of 250 feet. South of the dunes is the Marensin, which has long been a resin-producing district, and it is thought to have had harbors in Roman times, but the sands have long ago obliterated them. Still farther south along the coast is the Maremme, a region of large irregularly shaped dunes probably much older than those farther north, and occupied by an old forest of cork-oaks and resin pines.——Professor Giglioli embarked at Naples on July 25th, in the Italian man-of-war *Washington*, to resume his deep-sea and thalassographic observations in the Mediterranean.——On account of the frequent deaths of Europeans on the International Society's establishment on the Congo, a succession of new appointments have been made. These include two Swedish gentlemen, MM. Westmar and Sunvallson, and two English geographers, Sir F. Goldsmid and M. E. Delmar Morgan.

GEOLOGY AND PALÆONTOLOGY.

A NEW CHONDROSTEAN FROM THE EOCENE.—The Green River shales have produced hitherto eighteen species of fishes, one of which is a sting ray and the others Actinopteri. I now add a Chondrostean fish, which is the first one of the group described from our Eocene formations. The specimen representing the species lacks the head and pectoral fins. There are no traces of vertebræ, and there are well developed basilar interneurals and interhæmals.

Crassopholis, gen. nov.—Scales numerous, in oblique series, not in contact; formed of a small grooved disk and several posterior spines. Dorsal and anal fins short, posterior; the former commencing in advance of the latter. Caudal fulcra continued into broad flat scuta extending forwards on the median line. Superior lobe of caudal fin much more produced than inferior. A lateral line.

Crassopholis magnicaudatus, sp. nov.—Basilar interneural bones 18; body slender at dorsal fin and contracted at caudal peduncle. Dorsal and anal fins moderate, caudal very large, with strong anterior fulcral rays. The fulcral scuta are longitudinally oval, and have a groove along the middle line. The caudal hæmapophyses are short and expand distally. They soon disappear in the superior lobe or axis of the caudal fin. I count nine to the anterior more or less cylindric ones. The scales are subquadrate in form and measure about a millimeter each way, including the spines, Length from notch of caudal fin to line of anterior base of dorsal, M. .170; depth at anterior base of anal, .060; depth of caudal peduncle, .035; length of inferior lobe of caudal, .110.

This discovery introduces the ancient order of Chondrostei to our Eocene fauna. The specimen was found by Mr. E. W. Holland.

I add that gars of the genus Clastes are found in the Green River shales. They are of two species, one with an obtuse muzzle like that of a Polypterus, and the other of the longer nosed type like the *C. cuneatus*.—*E. D. Cope.*

THE CARSON FOOTPRINTS.—The first definite information we received on this subject was contained in a paper by Dr. Harkness, of San Francisco, and the NATURALIST published an abstract of his article. Soon after this we received a paper on the same subject from Professor LeConte, which did not differ materially from the one which preceded it. The evidence furnished by these gentlemen indicated that the tracks were made by some anthropoid animal. Not having myself seen the tracks, I could only use the evidence available. It is now stated by Professor Marsh that there exist impressions of small anterior feet which these gentlemen have not described. If this be so, the anthropoid theory is untenable. Professor Marsh thinks they are made by sloths. To prove this hypothesis it is necessary to account for the absence of claws. The facts that gravigrade sloths walked on the side of the foot does not preclude the taking of impressions of claws. It is said, however, that the tracks, as preserved, are not the real tracks, but only rather impressions of the tracks separated by several layers of mud.—*E. D. Cope.*

THE QUATERNARY BEDS AT BILLANCOURT, PARIS. — M. E. Riviére contributes to the *Revue Scientifique* an account of the fossils found in the sand-pits of Billancourt, near Paris. *Elephas primigenius*, *Rhinoceros tichorhinus*, the Irish elk, the reindeer, *Bos primigenius*, some bones of birds and a few sponges and shells occur along with human bones, and the bed is stated to correspond with the diluvium of the low levels at Grenelle and Levallois-Perret, and therefore to belong to the fourth of the six phases into which M. A. Gaudry divides the history of the Quaternary epoch in the Paris basin. These six phases are:

1. A hot phase, with *Elephas meridionalis*, transitional between Tertiary and Quaternary.
2. A grand glacial phase, with troops of reindeer and *Rhinoceros tichorhinus.*
3. A second hot phase, with the hippopotamus, deer, *Rhinoceros merkii* and *Elephas antiquus.*
4. A temperate phase, with a mixture of the species of hot and cold climates, including *Elephas primigenius, Rhinoceros tichorhinus* and the reindeer.
5. A second short cold period, the reindeer age, in which the rhinoceros has disappeared.
6. The present climate, to which belongs the age of polished stone (Neolithic).

THE JAVA UPHEAVAL.—"London, Aug. 29, 1883. A dispatch from Batavia, Java, to the Lloyds, says that the towns of Anjer, Tjiringin and Telokbelong have been destroyed by the volcanic eruptions. It also says that all the lighthouses in the Sunda straits have disappeared, and that where the mountain of Kramatan formerly stood the sea now flows. The aspect of the Sunda straits is much changed, and navigation is dangerous. The tidal wave completely destroyed Anjer. Many persons there were killed. The loss of life among both Europeans and natives at North Bantam was enormous. Since noon yesterday everything has been quiet. The sky is clear, and communication with Serang has been restored. The temperature fell 10° on Monday, but it is now at its normal height. The town is covered with a thin layer of ashes, which was so hot when falling that it killed birds. Telegraph linemen report that while they were at work repairing a line near Anjer, early Monday morning, they saw a high column of the sea approaching with a roaring noise. They fled immediately without learning the fate of the inhabitants. The quarries at Merak have disappeared, and all the people of the place perished."

The above dispatch is the first account received of one of the most disastrous volcanic upheavals on record, and following soon after the dreadful earthquake at Ischia, though of course in no way connected with it. A writer in *Nature* characterizes it as "the greatest phenomenon in physical geography which has occurred during at least the historical period, in the same space of time. From the daily newspaper press and an article in *Nature* we have made up the following account:

The center of disturbance is the volcano of Krakatoa, a little island some six miles long and four or five miles broad, situated in the straits of Sunda, between Java and Sumatra. On Sunday evening this volcano burst into a terrific eruption. The flashes from the subterranean fires were seen at Batavia, some eighty miles east of Krakatoa. The ashes from the volcano fell at Cheribon, a town 125 miles east-south-east of Batavia, and about 250 miles eastward on the north coast of Java, from the outburst, while the detonations were heard at Sœrakarta, in the central district of Java, a distance of over 300 miles. The town of Anjer suffered apparently not only from the volcanic disturbance but from a great tidal wave which swept through the straits of Sunda. Anjer is, perhaps we ought to say was, a little seaport on the Java side of the straits about twenty-five miles east of Krakatoa island. This island, estimated to contain 8,000,000,000 cubic yards of material, seems to have been shattered and sunk beneath the waters, while sixteen volcanic craters have appeared above the sea between the site of that island and Sibisi island, where the sea is comparatively shallow. The Sœngepan volcano has split into five, and it is stated that an extensive plain of "volcanic stone" has been formed in the sea near Lampong, Sumatra, probably at a part of the coast dotted with small islands. A vessel near the site of the eruption had its deck covered with ashes eighteen inches deep, and passed masses of pumice stone seven feet in depth.

Tjiringin, another place reported as destroyed, is also a coast town on the southern shore of the straits, some thirty miles southwest of Bantam, and perhaps fifteen miles east of Krakatoa. Telokbelong, a third town mentioned as in ruins, is not in Java at all. It is a coast town of Sumatra, in the Lawpong district, on the north side of the Straits of Sunda. The loss of life is estimated at 100,000. The Island of Onrust, where the floating dock has gone adrift with serious damage, is a little island off the north coast of Java, near the City of Batavia, and contains a large government yard for the building and repair of vessels. The localities named in the dispatch show that the tidal wave passed from the Island of Krakatoa eastward through the Straits of Sunda, sweeping both shores of that passage and reached the coast of Java on the morning of the 27th, and, thirty meters high, swept the coast between Merak and Tjiringen, totally destroying Anjer, Merak and Tjiringin.

Five miles of the coast of Sumatra seem to have been swept by the wave, and many lives lost. At Tanjong Priok, fifty-eight miles distant from Krakatoa, a sea seven feet and a half higher than the ordinary level suddenly rushed in and overwhelmed the place. Immediately afterwards it as suddenly sank ten feet and a half below the high water mark, the effect being most destructive. We shall probably hear more of this wave, as doubtless it was a branch of it which made its way across the Pacific, and that with such rapidity that on the 27th it reached San Francisco harbor, and continued to come in at intervals of twenty minutes, rising to a height of one foot for several days.

Farther advices from Colombo, Ceylon, dated London, Sept. 26, state that the recent earthquake at Java caused a sudden subsidence of the sea at Colombo of fifteen feet. On the 27th of August the water rose and fell violently for half an hour, when it resumed its normal condition. Several vessels broke from their moorings, but no other damage was reported.

DISCOVERY OF PALÆOZOIC ROCKS IN WESTERN BRAZIL.—The region about Cuyubá is generally low, with little hills and ridges, all formed of talcose and ferruginous schists, or of heavy quartz veins. The schists strike nearly north-east, dipping north-west at a high angle. The quartz is, in parts, very auriferous, and in their time the mines of Cuyubá have been among the richest in the world.

Twenty miles north-west of Cuyubá the land rises suddenly about 2000 feet, this is the *Chapadao* or table-land; it is not, as the name might imply, a *flat* elevated plain; the surface is rolling, or even hilly and mountainous in parts, and the streams run through deep valleys or cañons. This table-land, so far as I have seen it, is composed of soft sandstones and clays of various ages, overlying the schists and appearing at the edge of the plateau in long precipices, often several hundred feet high.

The village of Chapada is on the highest part of the *Chapadao* near its southern edge, and about thirty-five miles from Cuyubá. Half a mile west of this place, on an open hillside, I found a ferruginous sandstone with casts of Spiriferæ,Terebratulæ, Tropidolepti (?) and other brachiopods, with many Discinæ and Lingulæ; the latter were also found in a kind of iron-stone above the sandstone layer, and in soft shales below it. I found the same fossils at Laranjal, ten miles north-east of Chapoda, and at other points. The Discina appears to me to be the *D. lodensis*, found in the Hamilton group of New York State, and at Ereré, on the Lower Amazons; one of the Spirifers also resembles an Ereré species. These, with the Tropidoleptus, would, if my determinations prove correct, indicate a Lower Devonian horizon for the Chapoda beds; it is quite possible, however, that I may be wrong, as I have no books of reference on palæontology at hand, and I do not pretend to proficiency in that science. At all events the rocks described are Palæozoic, and in all probability either Devonian or Carboniferous.

My section through the Chapoda beds show nearly 500 feet of soft sandstones below them, the bottom of the series being a coarse conglomerate which rests on the schists described above. The fossiliferous beds themselves occupy from 100 to 200 feet (not yet well determined), and they are followed by nearly a thousand feet of soft sandstones, capped by 350 feet of conglomerate—in all over 2000 feet. The strike of the whole series is E. W., the dip being a slight one towards the north. The richest gold washings of the Chapodão are along streams which run over the sandstone and conglomerates *above* the fossil beds.—*Herbert H. Smith.*

GEOLOGICAL NOTES.—*Silurian.*—M. Lebesconte, on the occasion of the presentation to the French Geological Society of the posthumous works of Marie Roualt, gave the following reasons why Cruziana and Rysophycus, described by that geologist, should be considered to be vegetables and not the tracks of animals, as they were considered by M. Nathorst: (1) They are met with not only upon the lower surface of the beds but also upon the upper; (2) they occur even in the interior of the rock; (3) the great majority anastomose in a most intimate manner, showing plainly the points of junction, while the animal tracks that simulate vegetable forms are broken at the point of junction.

Devonian.—M. Oehlert has described in the Bulletin of the French Geological Society eight new crinoids from the department of Mayenne, including three Rhodocrinidæ, two species of Melocrinus, a Phimocrinus, a Lecanocrinus and a Hexacrinus.

Carboniferous.—M. Zeiller (Bull. Soc. Geol. France, May, 1883) gives the result of an examination of the coal beds of Tong-king. The flora of these beds differs somewhat from that of the coal beds of Europe, the greater part of Asia with China, and North America, and seems intermediate between that of these continents and that of Australia. The flora of the lower marine Carboniferous beds of Australia is similar to that of Europe, Asia and North America, and the coal beds of New South Wales must therefore be of Carboniferous age, to which also those of Tong-king belong.

Triassic.—M. Sauvage enumerates the fishes of the Muschelkalk of Lorraine, fourteen species in all.

Jurassic.—In a recent issue of the Bull. Soc. Geol. of France, M. Hebert discusses the beds containing *Terebratula janitor*, beds which he places in the Upper Jurassic, but with which M. Torcapel commences the Neocomian, and M. Parandier contributes a note upon the closed basins of the Jura mountains. These basins result from the crossing, in many directions, of dislocations of varying intensities. When the level of the interior of the closed basin is higher than that of the waters circulating outside of it, the rain water escapes by the fissures and tunnels, and penetrating through the fractures, makes its appearance outside the closed basin. This is the case with the basins of Saone and of Oroc, near Besançon, and with many others. When, on the contrary, the level of the bottom of the closed basin is below that of the waters exterior to it, these exterior waters penetrate into it along one of the lines of rupture, enlarging the fissure by their erosion.

In this manner the Donbs traverses the basin of Morteau, receiving a rivulet from its interior as it passes.——M. Cotteau also contributes a note upon the Jurassic echinids of Algeria, forty-seven in number. One only of these species is found in the Oxford stage; thirty-seven to the upper coralline, and seven seem to be Kimmeridgian. Nineteen are new and known only in Algeria, while the remainder occur in Europe, usually at the same stratigraphic levels.

Tertiary.—The cerebral hemispheres of *Arctocyon dueilii* and *Pleuraspidotherium aumonieri*, discovered by M. Lemoine in the Eocene of the environs of Rheims, are stated by that geologist to be so reduced in dimensions as to be scarcely superior in transverse diameter to the olfactory or the optic lobes, the latter of which are entirely uncovered.——M. Hebert (Bull. de la Soc. Geol. de la France, 1882) has described in detail the nummulitic group of the south of France. This group belongs to the Middle and Upper Eocene, and occurs in the Central Pyrenees, at Chalosse, at Corbières and Montagne Noire, and in the environs of Nice.

General.—Mr. G. K. Gilbert states that the great fault along the western base of the Wasatch mountains is wanting opposite Salt Lake City. He suspects that the fault will yet be completed at that point, and that when the slip occurs it will cause an earthquake which will destroy Salt Lake City.

MINERALOGY.[1]

EXPERIMENTAL STUDIES UPON ROCKS.—M. J. Thoulet,[2] after deploring the absence of general results arrived at by lithologists, has proposed to himself the study of all the physical properties of the same rock in order that, by a comparison of the data thus obtained, any relations which exist between these diverse properties may be discovered, and at all events the physical constants of the rock may be systematically stated. He holds that lithology should be systematized by the common application of both the physical and natural sciences to the study of the genesis of rocks, and shows the necessity of obtaining, in the first place, exact figures upon which to found satisfactory conclusions.

He gives the physical properties of a basalt and of a compact limestone, enumerating succinctly the locality, the macroscopic and microscopic appearance, specific gravity, chemical composition, *hygrometricity* or amount of moisture ordinarily contained, *imbibition*, or faculty of absorbing water, thermic conductibility, specific heat and resilient elasticity or power of rebounding.

This method of proceeding, although laborious, is believed to be alone capable of furnishing certain results.

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[1] Edited by Professor H. CARVILL LEWIS, Academy of Natural Sciences, Philadelphia, to whom communications, papers for review, etc., should be sent.

[2] Bull. Soc. Mineralogique de France, T. VI, No. 6, p. 161.